Radar Observations of Asteroid 4486 Mithra

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During July-Aug. 2000, this object was well placed for radar investigation for the first time since its 1987 discovery. We observed it at Arecibo at distances near 0.2 AU on July 22,23,25, and 28, obtaining images with delay resolution as fine as 0.5 usec (75 m in range). Then we observed it at Goldstone on Aug. 6,7,8, and 9, at distances less than 0.1 AU, obtaining images with delay resolution as fine as 0.125 usec (19 m). The maximum range extent of any of the echoes is 0.8 km; the object's maximum overall dimension may be significantly larger. All our higher-resolution images reveal a double-lobed object, apparently more severely bifurcated than any other near-Earth asteroid imaged to date. The bandwidth of the echoes is consistently very narrow, implying some combination of very slow rotation (evident from the barely noticeable variation in the appearance of images over several hours) and a radar line of sight not far from the apparent spin vector at any time during the experiment; the radar-observed sky arc was only about 35 deg. No simple periodicity in the day-to-day image sequence is evident, so non-principal-axis rotation is suggested. The alignment of the two lobes is almost parallel to the projected, apparent, instantaneous spin vector in some images but almost perpendicular to it in others, providing additional evidence for a very unusual spin state.